DOCUMENT RESUME

ED 422 936 IR 057 094

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TITLE	Refocusing the IS Curriculum: An Industry Perspective.
PUB DATE	1997-00-00
NOTE	10p.; In: Proceedings of the International Academy for Information Management Annual Conference (12th, Atlanta, GA, December 12-14, 1997); see IR 057 067.
PUB TYPE	Reports - Research (143) -- Speeches/Meeting Papers (150)
EDRS PRICE	MF01/PC01 Plus Postage.
DESCRIPTORS	Administrators; *Business Administration; Business Administration Education; Computer Software Development; *Curriculum Development; Databases; Foreign Countries; Higher Education; Information Management; *Information Systems; Information Technology; Student Surveys
IDENTIFIERS	Australia; *Information Age; *Organizational Structure

ABSTRACT

The emergence of information age organization structures challenges information systems (IS) educators to refocus IS curricula and to increase emphasis on topics that they predict to be especially important to organizations that adopt information age structures. These topics fall into four general categories: specific information technologies; application development; database systems; and information resource management. A survey instrument was designed to assess business manager/professional perceptions of the emergence of information age organization structures and to identify topical areas perceived to be important. The population was students in the Master of Business and Technology program at the University of New South Wales (Australia) Results suggest that business managers and professionals agree that emerging information age organization structures are also having an impact on business management practices and challenges. Curriculum implications for IS educators are discussed. (Contains 11 references.) (AEF)

REFOCUSING THE IS CURRICULUM: AN INDUSTRY PERSPECTIVE

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At the 1996 IAIM conference, Case, Bialaszewski, Dick, and Newson proposed that emerging information age organization structures may provide MIS educators with considerable guidance when making IS curriculum revision decisions. They argue that the examinaton of the patterns that may be observed as organizations evolve and adopt information age organization structures can help identify IS topics that warrant greater emphasis within current and future IS S curricula. Courses and curricula developed via this approach may better prepare students for careers in 21st century business organizations.

This investigation was initiated to assess whether practicing managers perceive movement toward information age organization structures. It was also designed to measure to extent to which Australian managers feel that specific topics are increasing in importance. The implications of the findings for IS

INTRODUCTION/PROBLEM STATEMENT

At the 1996 IAIM conference, Case, Bialaszewski, Dick, and Newson (1996) provided compelling arguments that IS educators should take note of emerging information age organization structures when developing IS curricula. Advances in information technology (IT) have enabled business managers to reconsider how their organizations and work processes are designed and to introduce fundamental changes in organizational structures that contribute to sustainable competitive advantage in the global marketplace. Such changes include streamlining/reengineering of work processes, flattening of management hierarchies, establishing an appropriate balance of centralized/decentralized decision making, establishing closer relationships with customers and suppliers, and creating virtual corporations. These changes are resulting in the emergence of new organizational forms which can generically be called information age organization structures. Such changes are likely to require the development of new management approaches and the re-examination of content of MIS courses and curricula to ensure that students are adequately prepared for careers in 21th century organization structures.

Several organization forms are commonly classified as information age organization structures. These include horizontal organizations organized around (reengineered) core business processes, network organizations, virtual organizations (Davidow and Malone, 1992), internal market structures (Halal, 1994), and T-form organizations (Lucus, 1996). The emergence of information age organization structures is consistent with the observations of many noted writers/researchers including Cronin (1994), Hammer and Champy (1991), Handy (1993), Keen (1991), Keidel (1994), and Orilkowski and Robey (1991). Such organization structures are expected to become increasingly prevalent in the years ahead and to be the norm, rather than the exception, by 2010.

As noted by Case et al. (1996), the emergence of information age organization structures

challenges IS educators to refocus IS curricula and to increase emphasis on topics that they predict to be especially important to organizations that adopt information age structures. These fall into four general topical categories: specific information technologies, application development, database systems, and information resource management.

Information Technologies Expected to Increase in Importance

Although communication and networking technologies have already assumed a prominent place in many IS curricula, the emergence of information age organization structures may require IS educators to pay even more attention them. Some of the topics that are likely to become more important as information age organizations continue to emerge include:

- Networking and communication technologies
- Internet, intranet, and World Wide Web technologies
- Video/teleconferencing technologies
- Telecommuting and other telework technologies
- Client/server computing technologies
- Groupware and workflow technologies
- Network operating systems and protocols stacks
- Remote access technologies
- Electronic commerce technologies
- Network management systems
- Laptop and mobile computing technologies
- Personal communication services
- Wireless communication systems/services
- Open computing architectures

Communication and networking technologies are the key components of the computing infrastructures of information age organization structures. This is especially apparent in virtual organizations, network organizations, internal market structures, and T-Form organizations. As a result of the emergence of these organization forms, networking and communications technologies are likely to come to forefront in IS curricula, while traditional computing technologies and topics are likely to lose the predominance that they have historically experienced in the MIS curriculum.

Application Development Topics Expected to Increase in Importance

Several application development topics are also expected to increase in importance with the emergence of information age organization structures. These include:

- Object-oriented programming and design
- Internet and WWW application development languages and tools
- Client/server application development
- Project-management
- Team programming
- Transorganizational application development
- Outsourcing and outsourcing management
- Application packages; commercially available business objects/applets

Object-oriented programming is expected to increase in importance because information age organizations with virtual components (such as network, virtual, T-form, and internal market structures) will require interorganizational applications that can be developed rapidly, preferably by leveraging ever-increasing libraries of custom and commercially available business objects. Web-oriented languages (such as Java and Perl) and web-oriented development tools/environments are expected to continue to increase in popularity keeping pace with increases in electronic commerce and Internet applications. Team programming and project management will become more important as application development teams composed of programmers from multiple organizations become more common.

Database Technologies and Applications Expected to Increase in Importance

Topical refocusing is also anticipated for database technologies and applications as information age organization structures become more prevalent. Changes in these areas include enhanced emphasis on:

- Distributed database systems and applications
- Client/server database systems and applications
- Object-oriented databases
- Database gateways/middleware
- Internet-based database applications
- Interorganizational database administration

Both distributed and client/server systems and applications are expected to be important to information age organizations that rely on interorganizational business partnerships (such as virtual organizations, network organizations, internal market structures, and T-Form organizations). Such business partnerships are likely to be dependent on the ability to leverage existing data resources within partner organizations (which will necessarily be distributed and often found on different platforms). Database gateways and middleware will be needed to enable communication among diverse distributed systems; the Internet is expected to be increasingly used for interorganizational (and intraorganizational) data access. As OOP becomes more common, especially for interorganizational applications, object-oriented databases and OORDMS will necessarily increase in importance. Data warehouses and interorganizational data warehouse management are also expected to increase in importance especially in organizations (such as those that implement internal market structures) that are interested in utilizing data mining to identify probable and/or untapped markets for their products/services.

Information Resource Management Topics Expected to Increase in Importance

The emergence of information age organization structures is also expected to have important implications for information resource management. Topics expected to become increasingly important in the years ahead include:

- Information architectures/infrastructures
- Interorganizational MIS planning/coordination
- Managing virtual MIS professionals
- Strategic data management
- Managing MIS partnerships

As noted above, virtual of MIS professionals and managing them will become more important as transorganizational application development teams become more prevalent. MIS planning is expected move beyond the ever-present challenge of coordinating MIS plans with organization-wide strategic plans. In information age organizations, MIS planning and coordination will often have to consider the strategic initiatives of multiple business partner organizations. Managing MIS partnerships will become increasingly important and, in many instances, this will encompass more than managing IS outsourcing relationships.

Business/Management Implications of Information Age Organization Structures

As noted by Case et al. (1996), the emergence of information age organization structures have important implications for the business curriculum beyond MIS. For example, the increasing prevalence of team-based organizations (such as process-centered and horizontal organizations) and networks of individuals/teams that cross traditional organizational boundaries will pressure business managers to develop *teamwork-oriented skills*, both as team leaders and team members. They must also be able to develop (interorganizational) team structures that facilitate the assimilation of new members as team support structures that enable the work groups to be productive.

Managers whose organizations are involved in *alliances* with other organizations will be increasingly challenged to balance current cooperation with potential (future) competition. They will be required to develop and manage the systems that govern information flows with allied organizations as well as systems that maximize organizational learning from the alliances.

In network organizations, strategic alliances with business partners and many flat organizations, managers will not be able to rely on traditional authority systems and chain of commands to get things done. When working on teams with people in different departments (or organizations) that have different sets of priorities and incentives,

managers will have to develop effective *negotiation skills*; they will have to learn to identify the interests and needs of people whose cooperation they must have and to identify "win-win" situations in which everyone involved benefits from such cooperation.

New incentive systems will be needed for information age organizations; new career concepts that involve horizontal movement rather than vertical movement (via promotion) up the once tall organizational hierarchy will also be needed. Twenty-first century managers will be particularly challenged to developed team-based incentive systems that balance individual contribution and group performance. Effective incentive systems for cross-organizational teams may be especially challenging for managers to develop.

In flat, team-based firms and organizations that are simultaneously involved in multiple network organizations or business partnerships, most managers and workers will be concurrently working on several projects or teams. Hence, it is important for them to develop *multitasking* skills—the ability to manage one's time and commitments so as to be able to work efficiently on several tasks.

Over the long haul, organizations that are able to learn from their experiences in strategic alliances, business partnerships, and network organizations will be best positioned for future growth and survival. Managers must become adept at developing *organizational learning systems* that capture lessons learned from the organization's involvement with other organizations and that include mechanisms for sharing the knowledge with other parts of the organization.

For organizations that implement globally-based internal market structures, *cross-cultural communication skills*, and *cross-border integration skills* (the coordination of activities that occur in different countries and contexts) are likely to be important managerial abilities. Stakeholder management (managing relationships with groups that have a stake in the survival and performance of the organization) is also likely to be especially challenging because with international operations, the range of stakeholders typically increases along with the chance of contradictory pressures from them.

The emergence of Information Age organization structures also implies that today's business students should master organization development and *change management* concepts/skills. Future managers must become adept at implementing new organization structures and incentive systems and for addressing the inevitable resistance that these changes will meet. In internal market structures, for example, change will be continuous: new business units will be created as others are being dissolved. Effective change management is likely to be crucial in such organizations.

Focus of the Current Investigation

The prediction that the topics listed above will increase in importance is based on the assumption that information age organization structures will become the norm rather than the exception within a decade after the turn of the century. Organization restructuring is a business decision made by business managers and other key organization members. As a result, they (business managers and professionals) are ultimately responsible for determining whether these predicted changes will occur. If practicing managers do not perceive that their organizations are moving toward information age organization structures, the predicted changes in IS topical importance may not be realized.

The current investigation was initiated to determine whether practicing managers and business professionals perceive their organizations as moving toward information age organization structures. In general, we expected practicing managers to demonstrate general agreement with the trends identified by Case et al. (1996) and to report increasing importance for key topics identified in the foregoing technology, application development, database, information resource management, and business management sections.

METHODOLOGY AND RESULTS

To test these a survey instrument was constructed. The content and focus of the survey instrument was intended to assess business manager/professional perceptions of the

emergence of information age organization structures and to identify topical areas that they perceived to be increasing in importance. (Please contact the authors for a copy of the survey instrument.

The population chosen for this study was students in the *Information Technology for Managers* classes of the Master of Business and Technology (MBT) programme at the University of New South Wales in Sydney, Australia. The industry-linked MBT programme is a result of collaboration between a number of major Australian companies and the University, and aims to provide management skills in range of technologies to suit both professionals and managers with limited technical expertise.

The Data

The results discussed below are based on the first administration of the survey to 66 MBT students, which has provided the investigators with the opportunity to summarize data from a significant group of professionals and managers. The group was predominantly male and relatively young – see Figures 1 and 2 below.

FIGURE 1

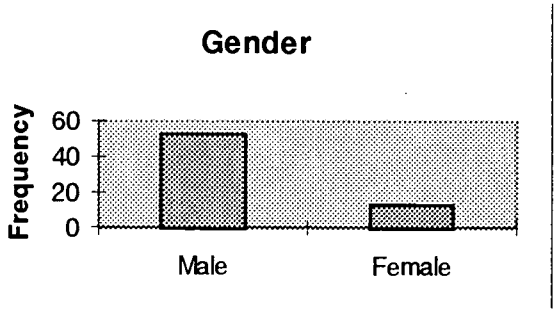
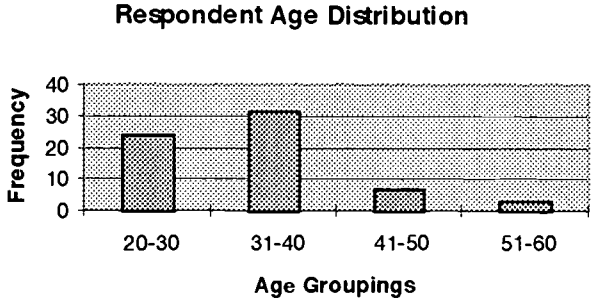


FIGURE 2



Survey respondents typically come from a professional background (the average time as a manager or professional was 2 - 5 years) and most make considerable use of information technology in their work - the average respondent had 5 - 10 years computing experience. Most of the respondents rated their computing abilities above halfway on a five-point scale ranging from "novice" to "expert". For an overview of the demographic data, see Figures 3 – 5 below.

FIGURE 3

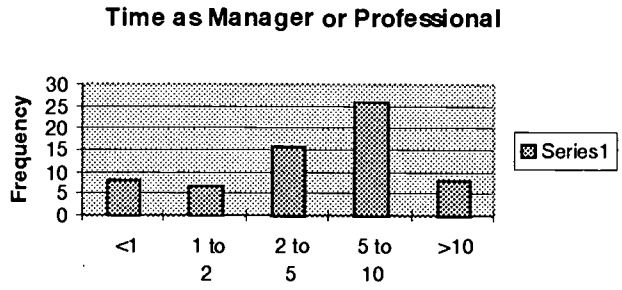


FIGURE 4

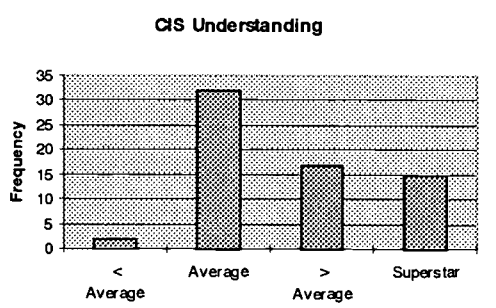
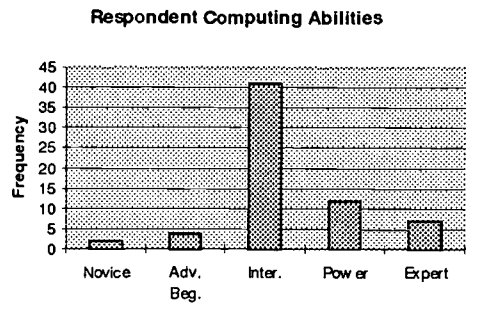


FIGURE 5



It can be seen from the above graphs that this group has a strong background in computer information systems and significant managerial or professional responsibilities. As such they are well placed to comment on issues related to the

emergence of information age organization structures as well as IS topics that are increasing in importance in their organizations.

In the questionnaire administered for collection of the survey data, respondents were asked to indicate their agreement with a series of statements, on a five point scale, ranging from *Strongly agree* to *Strongly disagree*. These responses were then graded from 1 to 5 giving an overall Neutral response a mean of 3.

Technologies

A large number of respondents agreed that the key technologies identified, particularly

TABLE 1

TECHNOLOGY ISSUES

Statement	Mean	Standard Deviation
1. The Internet will significantly change the way my job is done over the next five years.	2.6	1.10
2. Video-conferencing technologies will become more prevalant in my organisation in the near future	2.3	1.02
3. Wireless telecommunications are being increasingly utilised in my organisation.	2.4	0.97
4. Telecommunication technologies have assumed a central role in the information architecture of my organisation.	2.5	1.06
5. Client/server computing is increasing in importance in my organisation.	2.0	0.72
6. Data warehouses are increasing in importance in my organisation.	2.5	0.99
7. Network bandwidth is! an important issue in my organisation.	2.1	0.85

TABLE 2

APPLICATION DEVELOPMENT ISSUES

Statement	Mean	Standard Deviation
1. Team-based structures are becoming more prevalent in my organization.	2.3	0.99
2. "Virtual teams" is the way teams will work in the future, with members using telecommunications and computers to work together.	2.8	1.03
3. In the years ahead, outsourcing will be applied to an increasing number of my organization's business operations.	2.2	1.08
4. Project management skills are becoming more valuable in my organization.	1.8	0.79
5. Team development and team management skills are growing in importance in my organization.	2.0	0.75
6. Groupware is incresingly bineg used to support the activities of growps and work teams in my orgaization.	2.5	0.85
7. Object-oriented programming is increasing in importance in my organization.	2.6	0.83

networking and communications, the Internet and WWW, video and teleconferencing, client/server, wireless communications (and remote access), will have an increasing impact in the workplace. The following table gives an overview of the results for a range of issues by providing the means for each statement.

System Development Issues

Application development topics seen as particularly important included project management and outsourcing. Still important, but less so, were object-oriented programming, client/server applications and Internet-related tools. (See Table 2.)

Telecommuting

Telecommuting and remote work was seen as a mode of work increasing in importance with most respondents agreeing it is becoming commonplace and holding an expectation that all workers, but particularly managers, will be expected to work additional time at home. In this vein, most respondents have most of the essential "electronic enablers" of a PC and or laptop, a printer, a modem and a cellular telephone in their homes now (per capita, Australia is third in the world for the number of cellular telephones.) The number of respondents with modems at home was 69% (expected to increase to 83% in the next 2 years), 56% have a connection from home to the Internet (expected to increase to 81%) and while 20% currently have a 2nd telephone line, this is expected to increase to 50% in the next 2 years. Interestingly, while these results indicate a significant increase in the demand for a second telephone line, it seems the demand for cellular telephones may be leveling off. This data would certainly indicate that working from home will be facilitated by the take-up of these technologies and that virtual workers will be important parts of 21st century organizations.

Work Practices

It was the general area of changes to work practices and managing change that was identified by the respondents as having the most significance. The most important challenges perceived to be facing managers and professionals include finding new ways to use technology in the workplace and to improve decisions, outsourcing, telework (telecommuting and mobile computing), managing change, the impact of re-engineering business processes, and the acceptance of IT as a key to long-term competitiveness and a tool for re-shaping work. The respondents did not see re-engineering of business processes as a threat, instead they saw it as important in their organisations and looked forward to the use of IT to help in this process. Most respondents seemed to be relishing the

TABLE 3

Statement	Mean	Standard Deviation
1. I look forward to finding new ways to use new technology to help me in my job.	1.5	0.53
2. I feel that information technology enable s me to make better decisions.	2.0	0.74
3. As a manager, the implications of introducing new information technologies are particularly important to me.	1.9	0.61
4. Telecommuting and mobile computing are becoming more commonplace in my organization.	2.6	1.18
5. Information technology is enabling my organization to enhance its creativity and innovative potential through strategic alliances with other organizations.	2.5	0.85
6. Information technology is continually changing business processes within my organization.	2.1	0.79
7. Managing change is becoming an increasingly important aspect of my job.	1.8	0.81

opportunities that Information Technology might offer – they felt strongly that it enabled better decision making, saw the implications of its introduction as particularly important and indicated that managing change was an increasinly important aspect of their jobs. A summary of the responses to key questions are given in Table 3.

DISCUSSION AND CONCLUSIONS

In addition to providing a "snapshot of perceived hot skills", the data also lends support to the contention that the changes that are taking place in organisational structures and processes are likely to provide some guidance to IS educators in setting the curriculum. The data seem to indicate that Australian managers and professionals tend to agree that the types of information technologies identified as key components in computing infrastructures of information age organizations are, in fact, increasing in importance. These managers and professionals also demonstrated general agreement that the types of application development approaches considered to be most suitable for information age organization forms are also becoming more important in their organizations. In general, these findings provide support for our predictions.

These results suggest that business managers and professionals agree that emerging information age organization structures are also having an impact on business management practices and challenges. Both work and business processes are perceived as being significantly impacted by information technology. Telecommuting and an increased prevalence of virtual workers are perceived as posing key management challenges. Consistent with these trends, Australian managers and professionals see project management and change management as being increasingly important management skills.

Curriculum Implications

The current investigation and Case et al.'s 1996 IAIM paper have significant curriculum implications for IS educators. Several of these are highlighted below.

The first curriculum implication stems from the growing need to ensure adequate coverage of communications and networking technologies. The results of this investigation suggest that networking and communication technologies will continue to emerge as key components of the organization's computing architecture and infrastructure. As such, there is likely to be increasing pressure on IS programs to require IS majors to complete at least one course in business telecommunications; offering it as an elective may no longer be an option. IT-intensive courses (such as the introductory course) may transform into *Media 101* courses in which networking and communication technologies are covered at least as extensively as traditional computing technology topics. Over time, traditional computing technology topics may play lesser roles in such courses and may be overshadowed by coverage of networking and communication technologies. In sum, computing may become a subset of business telecommunications in the years ahead.

Our results suggest that OOP and Internet application development (including languages and tools) are likely to become more important in IS application development courses and curricula. Our results also indicate that importance of project management as an application development topic is especially likely to increase. The results also suggest that application development courses should devote more attention to client/server application development, groupware applications, managing virtual application development team members, business process reengineering, and outsourcing application development.

The information resource management implications of our findings include enhanced coverage of IT's ability to enable organizations to implement information age organization forms, to re-shape work and business processes, and to provide the organization with sustainable competitive advantage. Managing and supporting the virtual workforce, including virtual MIS professionals, also seems to deserve considerable attention in information resource management courses. Information resource management courses should also concentrate more extensively on outsourcing management and managing relationships with business partners.

In general, our results also suggest that information management courses and MIS service courses should devote more attention to information age organization structures such as network organizations, virtual organizations, strategic alliances, T-Form organizations, internal market structures, and process-centered organizations. As organizations continue to move toward such structures, IS and business educators are challenged to prepare students for life and survival in these new, emerging organization forms. Such preparation begins with adequate exposure to these organization structures within IS and business curricula.

Limitations and Future Directions

An obvious limitation of this research is that to date, it has been conducted in only one country and on a particular group of managers (those enrolled in the IT for Managers course in the MBT programme at the University of New South Wales.) To address this limitation, the authors would welcome the opportunity to share their data and the survey instrument with colleagues willing to do comparative studies involving a broader range of respondents.

A second limitation is that the survey instrument does not provide an exhaustive test of Case et al.'s (1996) predictions concerning increasing importance of specific IS topics. A more comprehensive survey instrument administered to multiple (international) samples would provide a better test of the accuracy of their predictions.

The third limitation is largely conceptual in nature and concerns the consistency between curricula derived from the evolution of organization structures and the AIS/AITP/ACM IS Curriculum Model. That is, to what extent are topics relevant to information age organizations addressed in the curriculum model's learning units? Are there unaddressed topics beyond the learning units or are the learning units sufficiently robust to address the topical changes that Case et al. expect? Such a comparison at the learning unit level could provide an avenue for assessing the curriculum model's resiliency.

Other useful avenues for future research include longitudinal assessments of employer demand for the types of skills, knowledge, and abilities to see if they predictably increase in importance. Research examining the number of business organizations that actually implement information age organization structures also seems warranted.

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